

# The Cost of Medication Waste

The cost of maintaining Canada's health-care system is escalating out of control. Canada spent 10 per cent of GDP on health care in 1994, and this percentage is expected to increase. Governments, health-care providers and consumers have to find ways to reduce these escalating costs while maintaining the quality of care that Canadians have grown to expect.

Medication use and its costs have increased over the last several years. In 1994 spending on pharmaceuticals reached \$9.1 billion and from 1992 to 1995 the number of prescriptions increased by 19 million. As the average age of the population increases, the number of prescriptions per patient will inevitably increase also. There is an urgency to implement programs that optimize medication use. Some programs have tried to reduce the cost of providing medications to patients. These programs have focused on generic substitution, increasing patient deductibles, minimizing fees paid to providers, increasing the supply of medication given to a patient, and the development of restrictive formularies and prescribing guidelines. These programs focus on either reducing utilization of services or on restricting the service provided. They have existed for several years and although many of them have reduced the cost of delivering medication to patients, most demonstrate only short-term benefits and fail to focus on the major reasons for rising costs.

Medication waste is an unnecessary burden on an already fiscally restrained health-care system. Medication waste is a factor of changes in prescribing policies, noncompliance (intentional and unintentional), and drug and dosing changes. Noncompliance is a substantial cost burden, and a recent study estimates it costs Canada approximately \$8 billion annually.

Intentional and unintentional noncompliance may reduce medication costs, but will likely lead to a substantial increase in health-care costs associated with the treatment of progression of disease and the treatment of ensuing complications. Although most changes in

medication and dosage are warranted, providers should be educated on the optimal point of these changes. This would lead to better patient outcomes and the least amount of medication waste.

The purpose of this study was to estimate the amount of medication waste in the Sudbury region during a medication cabinet cleanup campaign.

## Study design

In November 1995, the Sudbury and District Pharmacists Association conducted medicine cabinet cleanup campaign for Sudbury and its local districts. Patients, who were informed of the campaign through newspaper articles, in-store posters, and shopping bag inserts, returned unused and expired medication to participating pharmacies. Although there are many similar campaigns held by pharmacies each year, the Sudbury event differed substantially as the participating pharmacies recorded the name, quantity, cost and payer of the medication returned. Twenty-nine pharmacies participated in the study.

To assess participation in the campaign, a random telephone survey asked if patients had heard of and participated in the campaign. Patients were also asked if they had disposed of medication in the past, and if so, what method of disposal was used.

To determine the significance of the returned waste data, the dispensed data for four stores in the region was obtained. These stores are from different geographical sections of the region and should reflect the amount and different types of dispensed medications.

## Results

The waste medications were sorted into 10 different drug classes. The class allocation of the medication returned is shown in Table 1. Cardiovascular (high blood pressure, heart, and circulation) medication was the class with the highest dollar amount of medication returned. This group was followed closely by analgesic and antiinflammatory medication. Gastrointestinal, endocrinological (hormone) and neurological med-

ications (anti-depressants, epilepsy, benzodiazepines) made up a substantial amount of the medication returned.

The 10 classes of medication were further divided into subclasses based on intended effect of the medication. Table 2 indicates the top 10 subclasses and the percentage of total dollar value returned. Antihypertensive (blood pressure) medications were by far the most expensive subclass returned. These maintenance drugs contributed over 15 per cent of the cost of all the medications returned. Antiinflammatory, acid inhibitor, analgesic and antibiotic medications followed. Antihypertensives and acid inhibitors medications will be discussed in greater detail in the following sections.

The medication returned was further divided into two major subgroups

**TABLE I**

**Percentage of Total of each Class of Medication**

Cardiovascular . . . . .	.25.7%
Analgesic and Antiinflammatory . . .	19.2%
Endocrinological and Neurological	15.3%
Gastro-Intestinal . . . . .	12.9%
Miscellaneous . . . . .	7.2%
Antibiotics . . . . .	6.2%
Asthma . . . . .	5.8%
Cold and Allergy . . . . .	4.7%
Dermatology . . . . .	2.9%
Constipation . . . . .	0.1%

**TABLE II**

**Top Subclasses of Medications as a Percentage of Total Returned**

Antihypertensives . . . . .	15.2%
Antiinflammatory . . . . .	10.4%
Acid Inhibitor . . . . .	7.5%
Analgesic . . . . .	6.9%
Antibiotic . . . . .	6.0%
Asthma . . . . .	5.9%
Allergy . . . . .	3.8%
Antidepressant . . . . .	3.5%
Cholesterol . . . . .	3.3%
Endocrinological . . . . .	3.1%

**TABLE III****Comparison of Acute and Maintenance Medication Returned**

Acute Medications . . . . .	36.9%
Maintenance Medications . . .	63.1%

acute and maintenance medications. For the purposes of this study acute drugs are medications which are usually taken for a very short period and then stopped. This group includes drugs such as antibiotics, cold, pain and antiinflammatory medications. Maintenance drugs are medications patients take for a longer period, usually more than one month. This group would include drugs such as high blood pressure, thyroid, stomach, and cholesterol medications. Table 3 indicates the breakdown of acute to maintenance medications.

Previous studies have shown that compliance with acute medications such as antibiotics and antiinflammatories has been a problem. As many patients do not finish their course of therapy, waste was assumed to be extremely large for these classes of medication. Trial prescription programs in British Columbia and Saskatchewan have been implemented to reduce the waste associated with antiinflammatory medications. This has resulted in substantial cost savings for the participating governments. The cleanup data demonstrates that the cost of maintenance medication waste is actually the larger of the two categories. Maintenance medications were never thought to be a substantial factor in terms of drug waste. These medications are to be taken continuously and should not be stopped suddenly.

There are several possible reasons why the returned maintenance medications were higher than acute medications. These may include higher prescription volume, higher cost, frequent changes in prescription and compliance factors such as treatment fatigue. Programs should be implemented to reduce this waste. These programs should include patient and

health-care provider education, compliance strategies and changing the current method of providing medication services to decrease the risk of complications and reduce medication waste.

The number of times a drug is returned gives an indication of the frequency of prescribing and the level of medication noncompliance. The top 20 drugs based on frequency are shown in Table 4.

High blood pressure medications made up the largest dollar category of waste during the cleanup campaign. These medications contributed more than 15 per cent of the total value of the medica-

ACE inhibitors also made up a large portion of the waste within this class. Calcium channel blockers and ACE inhibitors tend to be more expensive than the older classes of blood pressure medications, such as diuretics and beta blockers. Table 5 indicates the percentage of the cost of each of the classes of high blood pressure medications returned. Table 6 illustrates the percentage of days returned if average dosing for each of the medications is used.

To determine whether the differences in dollars and days returned were significant, the dispensing data for four stores

**TABLE IV****Medications Returned with the Greatest Frequency**

Medications	Frequency	Medications	Frequency
Ranitidine 150 mg	64	Losec 20 mg	24
Tylenol #3	52	Tylenol #2	24
Pen Vk 300 mg	36	Docusate Sodium 100 mg	23
Novasen 325 mg	29	Erythromycin 250 mg	22
Slow K	29	Naproxen 250 mg	22
Ibuprofen 400 mg	28	Furosemide 40 mg	21
Imodium 2 mg	28	Toradol 10 mg	21
Lorazepam 1 mg	26	Norflex 100 mg	20
Amoxicillin 250 mg	25	Sulfatrim DS	20
Lanoxin 0.25 mg	25	Cytotec 200 µg	19

tions returned. Dosage and drug change, patient death and improvement of blood pressure control all contribute in part to the waste of high blood pressure medication. Noncompliance is a major problem with this class of medication. High blood pressure is usually symptom free and the therapeutic endpoint is "silent" (patients cannot feel when the medication is working). For these reasons patients tend to be noncompliant or partially compliant with their medication. More than 50 per cent of patients with high blood pressure stop taking their medication within the first year of therapy.

Of the group taking their medication, only two-thirds are taking enough medication to adequately control their high blood pressure.

The cost of calcium channel blocker waste was higher than all other high blood pressure medications combined.

within the study were obtained. The data for these stores were retrieved for the period from Sept. 1 to Dec. 31, 1995. This would include the study month and

**TABLE V****Percentage of the Cost of Each Returned High Blood Pressure Medication Class**

Calcium Channel Blockers . . . .	.56 %
ACE Inhibitors . . . . .	.27 %
Beta Blockers . . . . .	.12 %
Alpha Blockers . . . . .	.3 %
Diuretics . . . . .	.2 %
Central Acting Agents . . . . .	.0.2 %

**TABLE VI**

**Percentage of Days  
Returned for Each Class of  
High Blood Pressure  
Medication**

Calcium Channel Blockers ..	35.7 %
ACE Inhibitors .....	28.8 %
Beta Blockers .....	18.9 %
Alpha Blockers .....	3.5 %
Diuretics .....	11.7 %
Central Acting Agents .....	1.4 %

allow for inclusion of three months' supply dispensing, commonly associated with antihypertensive medications.

Table 7 displays the percentage of total antihypertensive costs dispensed versus returned. Table 8 indicates the percentage of total antihypertensive days dispensed to days returned.

Cost and patient days are presented to take into consideration the large cost differences between some antihypertensive classes. As Tables 7 and 8 indicate, the dispensed and returned data for antihypertensive medications are similar for every subclass. As mentioned earlier, waste in this class is due to noncompliance, drug and dosage changes, and patient death. The similarity in the data indicates that these three variables are

constant for every subclass of antihypertensives. This would suggest that waste of antihypertensive medications is not directly related to the individual drug but more a variable of the disease state.

Acid inhibitors are one of the fastest growing sections of prescription medications. This subclass is composed of three major categories. These include antacids, Histamine-2 (H2) blockers, and proton pump inhibitors. There has been a major switch in the prescribing habits of this class of medications. The switch has been from the older antacids and H2 blockers to the more effective and expensive proton pump inhibitors. Governments, payers, and providers need to decide whether this change can be attributable to increases in the frequency and severity of stomach conditions or is it simply over-prescribing of the more expensive medications to patients.

Unlike hypertension treatment, the conditions which these drugs are used to treat vary from mild to severe. Compliance is not as great a problem as seen with cholesterol and hypertension, as these conditions have symptomatic endpoints. If patients fail to comply with their treatment regimen they will usually experience a worsening of their disease symptoms.

Three classes of acid lowering medications were returned during the medication cabinet cleanup campaign. To determine the prescribing habits in the Sudbury area the dispensing data for three pharmacies were obtained and compared to the returned data. Table 9 shows the percentage of drug costs for the dispensed and returned data. As the cost of these medications varies so considerably, the days dispensed and returned are presented. Antacid dosing is extremely variable and patient specific and therefore was not included the percentage of days analysis. The percentage of days dispensed and days returned are presented in table 10.

The data indicate the percentage of cost returned versus dispensed did not vary dramatically for antacids and generic H2 antagonists. The brand name H2 antagonists were wasted in greater percentage

**TABLE VII**

**Percentage of Cost of Antihypertensive Medications  
Dispensed versus Returned**

Antihypertensive Class	Percentage Cost Dispensed	Percentage Cost Returned
ACE Inhibitors	31.24 %	27.36 %
Alpha Blockers	4.54 %	2.62 %
Angiotensin 2 Inhibitors	0.18 %	0.00 %
Beta Blockers	9.83 %	12.14 %
Calcium Channel Blockers	52.35 %	56.17 %
Central Agents	0.35 %	0.17 %
Diuretics	1.52 %	1.55 %

**TABLE VIII**

**Percentage of Days of Antihypertensive  
Class Dispensed versus Returned**

Antihypertensive Class	Percentage Patient Days Dispensed	Percentage Patient Days Returned
ACE Inhibitors	28.37 %	28.77 %
Alpha Blockers	5.54 %	3.46 %
Angiotensin 2 Inhibitors	0.14 %	0.00 %
Beta Blockers	19.18 %	18.94 %
Calcium Channel Blockers	32.09 %	35.72 %
Central Agents	1.08 %	1.40 %
Diuretics	13.61 %	11.71 %

of days and medication cost. This result is probably due to a small sample size and may not be a true indication of the actual medication waste pattern. Proton pump inhibitors were actually wasted in a smaller percentage in terms of percentage cost and days.

### Random telephone survey

To determine awareness of and participation in the campaign, a random telephone survey was conducted. Respondents were asked if they had heard of the medication cabinet cleanup campaign and if they participated. They were also asked if they had ever disposed of medications in the past. The results from these questions are displayed in Table 1.

Only 34 per cent of respondents were aware of the campaign and less than eight per cent participated. Over 63 per cent of all patients asked had disposed of medications in the past. These patients were then asked which method of disposal was used. Table 12 shows methods of disposal of medication in the past.

The random telephone survey found that only 7.4 per cent of the population returned medication to a participating pharmacy during the study period. The telephone survey indicates that more than 63 per cent of the population had disposed of medication in the past. We can assume that about 56 per cent of the population discard their medication by another method. By multiplying by the appropriate factor, the \$67,000 collected actually represents over \$510,649 for the 29 participating pharmacies. If we assume the pattern of waste is consistent across the province of Ontario and we extrapolate to the 2,380 pharmacies in the province, the cost of the waste is approximately \$41,908,435. If extrapolated across Canada, the cost of this waste reaches approximately \$113,381,687.

### Discussion

Medication waste and noncompliance are major problems in Canada's health-care system. Currently, cost containment involves either eliminating a particular health-care service or placing restrictions upon the service provided. Although some of these methods lower cost, many

**TABLE VIII**

### Cost Percentage of Dispensed Acid Lowering Medications versus Percentage Cost Returned

Class Of Medications	Percentage of Dispensed Cost	Percentage of Returned Cost
Antacids	2.32 %	0.37 %
H2 Antagonists (Brand Name)	11.51 %	26.92 %
H2 Antagonists (Generic)	39.65 %	35.91 %
Proton Pump Inhibitors	46.52 %	36.79 %

**TABLE X**

### Percentage of Days of Acid Lowering Medications Dispensed versus Returned

Class Of Medications	Percentage of Days Dispensed	Percentage of Days Returned
H2 Antagonists (Brand Name)	8.67 %	17.53 %
H2 Antagonists (Generic)	64.07 %	61.79 %
Proton Pump Inhibitors	27.26 %	20.68 %

**TABLE XI**

### Results of Random Telephone Survey

	Percentage of Respondents
Aware of Campaign	33.7 ± 6.0 %
Participated in Campaign	7.4 ± 3.4 %
Disposed of Medication in Past	63.8 ± 6.0 %

are shortsighted and do not focus on positive patient outcomes.

Although the dollar cost of medication returns is substantial, we must look further to evaluate the patient consequences attributed to this waste. Millions of dollars of antihypertensive medication waste may be insignificant when compared to the treatment of complications due to the uncontrolled hypertension among these patients.

An investment in proper patient and health-care provider education is an appropriate first step in reducing medication waste. The patient education

**TABLE XII**

### Method of Disposal of Medications in Past

Method of Disposal	Percentage of Patients Utilizing the Method
Toilet	46 %
Trash	31 %
Pharmacy	17 %
Physician	2 %
Other	4 %

# Drug Waste in a long Term Care Facility

Seniors are the largest consumers of medications and face the highest risk of adverse drug reactions. Many older patients have multiple disease states or decreased physical and mental function and are placed on complicated drug regimens, factors that can lead to potential problems with noncompliance.

It's estimated that inappropriate drug use and noncompliance costs Canadians approximately \$8 billion annually. The U.S. Food and Drug Administration estimates the annual costs of hospitalizations due to inappropriate use of prescription drugs to be \$20 billion.

To curb the growth of medication costs, payers have implemented cost-containment programs, including cost sharing measures such as medication deductibles and co-payments. In Ontario the deductibles are structured for patients to maximize their day supply of medication – or they face higher deductibles – and three-month prescribing and dispensing is commonplace. This approach leads to lower dispensing fees paid by the government, but it may also lead to a substantial increase in the cost of medication waste.

Nursing homes offer an excellent opportunity to estimate the true amount of medication waste among seniors in Canada. Medications in nursing homes are usually dispensed in medication cards with the supply normally less than 35 days. Typically, they are given to patients by health-care personnel and therefore noncompliance is minimal.

The purpose of this study was to calculate the amount of medication waste in one nursing home in Ontario.

## Study design

The study involves estimating the amount of medication waste in an 85-bed, publicly funded nursing home in

Ontario. Nursing homes in Ontario are required to keep appropriate records of surplus prescribed drugs. The surplus prescribed drugs report was obtained for this nursing home and the cost of

**TABLE I**

### Percentage of Total Cost of Each Medication Class

Medication Class	Percentage of Total Cost of Returned Medication
Cold and Allergy	0.15 %
Antibiotics	2.94 %
Gastro-intestinal Agents	7.85 %
Neurological and Endocrinological	17.65 %
Analgesic and Antiinflammatory	1.90 %
Cardiovascular	6.81 %
Topical	27.17 %
Respiratory	26.09 %
Miscellaneous	9.45 %

**TABLE II**

### Medication Waste as a Factor of Total Dispensed

Total Dollar Value of Medication Waste	\$ 1212.37
Total Dollar Value of Dispensed Medication	\$ 9225.00
Percentage Waste of Dispensed Medication	13.14 %

the medication waste was calculated. The report obtained was for the period from Oct. 17 to Nov. 20, 1996.

The total dollar amount of medication dispensed to the nursing home during this same period was also obtained.

## Results

Medication waste data was divided into nine different categories. Table 1 shows the allocation of the medications

returned. Topical agents was the most expensive class of medications returned, followed by respiratory and neurologic and endocrinologic medications.

Table 2 shows the cost of the medication waste as a percentage of the total dollar value of medications dispensed during the same time period. The prices are from the dispensing pharmacy's computer and reflect the price charged to the nursing home occupants or the appropriate payer.

## Discussion

Nursing home patients tend to have multiple disease states and are placed on some of the more complex drug regimens. Staff at these facilities offer support by distributing medications to minimize confusion and promote compliance. Many residents have stable medical conditions and therefore take many of their medications long term with very little drug regimen changes or dosage adjustments. For this reason,

medication waste has not usually been regarded as a large problem within this population. This small study, however, demonstrates that medication waste may be a driver in the increasing cost of the Ontario Drug Benefit plan.

This 85-bed nursing home wastes approximately 13 per cent of all the medication dispensed. The figure is conservative, as it does not include medications dispensed by the Ontario

government's dispensary.

Topical medications contributed the largest amount of drug waste. Within these facilities topical medications are usually taken for acute conditions such as topical dryness, infection, and dermatitis. It would be interesting to determine if protocol based prescribing for these conditions or limiting the supply of topical preparations lead to substantial cost savings for the payers.

Drug utilization review programs (DUR), protocol-based prescribing, and restrictive formularies have been implemented in several centres. These programs are meant to decrease the number of medications consumed by residents and to aid in the selection of the most appropriate drug therapy. DUR programs have been implemented and have led to substantial cost savings? The nursing home in this study underwent a voluntary pharmacy based DUR program. The program has led to a reduction in the quantity of medica-

tions consumed. It would be useful to compare this data with another similar nursing home in Ontario which has not undergone a DUR program to determine the effectiveness of such reviews.

Medication waste is an unnecessary cost burden to the government and taxpayers of Ontario. Before implementing changes to drug benefit programs,



**Before implementing changes to drug benefit programs, payers should attempt to estimate the impact of these changes on medication waste.**

payers should attempt to estimate the impact of these changes on medication waste. Some changes may simply shift the potential savings to the benefit programs, if these changes increase the amount of medication waste. If medication waste in this long term care facility is 13 per cent, how large is the prob-

lem in the general population, where noncompliance, and three-month prescriptions are common?

Structured studies examining medication waste in long-term care facilities and the general population may offer new routes of cost containment, without increasing the burden on the patient.

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component should focus on supplying unbiased information in terms of the disease state, consequences of the disease, role of treatment and realistic expectations with respect to treatment. Patient education sessions by pharmacists, physicians, and nurses may be the first step in filling this void. Provider education must focus on the selection of the optimal medication for each patient. This would involve selecting the best treatment with respect to patient outcomes, quality of life, compliance and treatment cost. These education programs are in their infancy, and without further funding and promotion will never achieve their maximum benefits.

Pharmacists are in the best position to reduce the needless burden of medication waste in the health-care system. They are the most accessible front line health care provider and are in an optimal role for patient education. With proper incentives through government and industry based programs, pharmacists can focus on filling the void of patient education, increasing compliance and improving patient outcomes.

Medication waste and noncompliance are problems which should be addressed immediately. Ignoring them will lead to larger costs due to complications in treatment. The investment in waste reduction programs will be substantially less than the millions in potential drug savings. Without appropriate intervention this problem will not disappear and will likely escalate as our population ages and medication use increases.

## References

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